Lost Vikings of Greenland

http://www.pbs.org/wnet/secrets/previous_seasons/flash/vikingsframe.html

NARRATOR
Greenland, the world's largest island. Blanketed by ice two miles thick where glaciers meet the sea and icebergs choke the fjords.

For more than a thousand years settlers have called this marginal land home.

Amidst the scattered dwellings of today's residents lies a mystery from the past.

These stones are all that remain of a lost Viking civilization.

About a thousand years ago, the Vikings, Norsemen from Norway, established a colony in Greenland. For almost five centuries they flourished here, then they suddenly disappeared. They left behind a riddle that scientists, historians and archaeologists have all failed to solve - until now.

JUDITH JESCH
The colony in Greenland disappears from history in about the year 1500. Nobody knows exactly why or exactly when this happened. It's one of the great unsolved mysteries of the middle ages.

NARRATOR
The first settlement to disappear lay on the west coast of Greenland. Around 1340 a visitor from the Vikings home in Norway sailed into this Fjord. What he found shocked and amazed him.

The emissary's name was Ivar Barderson.

JUDITH JESCH
When he arrived there the place was empty, there was no one there and he says in his report.

NARRATOR
'I saw nobody, neither Christians nor heathens, only some wild cattle and sheep, all running wild'.

JUDITH JESCH
This means the settlement was empty. The Norse Greenlanders had left or died out, probably fairly recently since the domestic animals were still there.

NARRATOR
Bardarson was the first of many, who over the centuries have wondered what could have caused a once prosperous civilization to suddenly disappear?

Today, 650 years later, an international team of scientists has come to Greenland hoping to find the answer.

The team includes archaeologists, physicists, chemists and botanists, who are pooling ideas and resources. Among them is Dr Bent Fredskild, a botanist who has been fascinated by the lost Vikings for more than 40 years.

BENT FREDSKILD
It's a long story. It started in 55, my first visit and since then I have spent 29 whole summers in different places in Greenland.

NARRATOR
Outside the few small towns, Greenland has no roads. Like the Vikings before them, the scientists rely on boats to get around.

One of the first steps in their investigation is the excavation of a key Viking site.

In a remote coastal valley, a sheep farmer has stumbled across the ruins of a farmstead.

The team of scientists from Scandinavia, Britain and the United States is led by Dr Jette Arneborg of the National Museum of Denmark.

JETTE ARNEBORG
The disappearance of the Norse Greenlanders is a mystery. Every new generation has new answers and I think that's very exciting and in a way, that reflects that history is very much alive in our society today.

NARRATOR
The team will camp here for a month, making the most of the few short weeks of the Arctic summer. They hope this dig will yield the answer to what really became of the Greenland Vikings.

They turn to what may seem like a peculiar place to look for clues.

NARRATOR
(OVER MAN SPEAKING)
Here, they are working through a midden, or garbage dump. Every farmstead had one and into it generations of Viking families threw their waste, everything from leftover food to the outgrown treasures of childhood.

JETTE ARNEBORG
Can you see? It's a horseman. We don't know really what those horses were for but we guess that they were toys. Children's toys.
Perhaps they had something, uh, something to do with horses here, I don't know.

NARRATOR
Every object will be dated, because the archaeologists can calculate exactly when each layer of the midden was laid down.

JENS FOG JENSEN
The very top of the transept that just came on a few years ago and then beneath this we have a recent peat layer. And then there is the first uh Norse layer, one could call it, which has a lot of charcoal and bone remains in it. The Viking period is actually documented all the way from the bottom until 15cm below the recent surface.

NARRATOR
The excavations have helped the team build up a remarkably detailed picture of life in Greenland at the height of the Viking civilization. They have gleaned further facts from an extraordinary collection of historical documents written by Icelandic scribes in the Middle Ages. These chronicle how the Norsemen first came to this unknown land, then on the outermost edge of the inhabitable world.

Now preserved in this institute in Iceland, the Sagas present a wider picture; they illustrate how the Vikings built an empire that extended from their homeland in Scandinavia, east across Russia and south to the shores of the Mediterranean Sea.

GISLI SIGURDSSON

The Icelanders in the middle ages were notorious for writing, they wrote much more than any of their Scandinavian neighbors. They were writing sagas about Kings, Legendary hero's of the Viking past and themselves as well as people in the Faroe Islands, the Orkney's and in Greenland and this is where we are told about the Vinland voyages, about the discovery of North America.

NARRATOR
America, called Vinland by the Vikings was the westernmost outpost of their empire. In the 1960's archaeologists discovered and reconstructed the only known Viking settlement on the North American continent. It's at L'Anse aux Meadows on the northern tip of Newfoundland.

Here the Vikings built houses for around a hundred people. But the sagas suggest the experiment was short lived. After perhaps as little as three years, constant skirmishes with the indigenous people, and the difficulties obtaining supplies from Europe drove the settlers away. Of all the Viking colonies, the American was one of only two that failed. The other was in Greenland.

And although mysteriously, the sagas do not explain why the Greenland settlers disappeared, they do record the facts of the colony's foundation.

DR JUDITH JESCH
The earliest and most reliable source tells us of a man called Erik the Red from Norway who had heard of a country to the west and sailed to find it and discovered it and called it Greenland. And went back with 25 ships of settlers. Erik the Red settled in what's called the Eastern settlement in Greenland. There was also a smaller settlement in the western settlement. Of the 25 ships that went to Greenland only 14 arrived but later, colonists kept arriving after that.

NARRATOR
The scientists have established that the Viking colonists were farmers. They lived in houses like this Icelandic reconstruction, built from turf, stone and timber in the style of their ancestors back in Scandinavia.

The life of the Greenland Vikings was being pieced together.

JUDITH JESCH
They lived in small isolated farmhouses and you have to remember that it was dark for most of the year that far north, so they would sit indoors and amuse themselves, by composing poetry, telling stories, carving toys out of wood and ivory... playing chess perhaps...

NARRATOR
The Vikings built houses, stables and cowsheds, hidden in sheltered valleys among the coastal hills.

Each summer, they grew fodder and hay for their animals on the high pastures. One task for today's archaeologists is to map these settlements. Here are the remains of a compound one farmer constructed for the sheep, cattle and goats he'd imported from back home in Scandinavia.

The ruins show that over the years the Viking population grew. Before their disappearance, up to 6,000 occupied Greenland.

In winter, the Vikings lived cheek by jowl with their animals, sheltering from the piercing Arctic cold. Unable to exercise in these cramped conditions, the animals lost the use of their legs and when spring finally came, they had to be carried out in to the fields to graze.

JUDITH JESCH
The Vikings lived by subsistence agriculture in Greenland and they had to import a lot of the things that was necessary to their lifestyle. They had to import timber for the housing, they had to import iron for the nails to build the houses with and in order to get these from abroad, for instance from Norway, they exported Greenland falcons, which were known as far away as Sicily. They exported walrus ivory and in the early Middle Ages, this was the only source

of ivory. It was exported throughout Europe, and carved into beautiful objects found in churches.. crucifixes, caskets and the like.

JUDITH JESCH
The last known communication from Norse Greenland was in the year 1410 when a party of Icelanders arrived in Norway, by way of Greenland.

While they were there, two of them decided to get married and we have very detailed records of the wedding that took place in the church at Hvalsey on the 16th of September in 1408. And it said that there were many people there, both Greenlanders of Viking descent and foreigners.

PRIEST
(IN BACKGROUND)
In nomine patre, in filis spiritus sancte ...

JUDITH JESCH
It was all done properly; the banns were read out in church for 3 weeks before the wedding. The same Icelanders also witnessed some dramatic events while they were in Greenland. A man called Kolgidiemur apparently seduced a married woman using witchcraft and black arts and was sentenced to death by burning at the stake. The woman he seduced never really recovered from this experience and she died shortly afterwards.

NARRATOR
After this report, nothing more was heard from the Greenland Vikings.
They vanished, seemingly into thin air.

Today, the finds from excavations are all that archaeologists have as they seek an explanation for the mysterious disappearance. But this hasn't stopped them from toying with some extraordinary theories.

JUDITH JESCH
One possibility is the plague, that they died of illness and the colony was just wiped out. Another possibility is that they were kidnapped by pirates .. it's also been suggested that they intermarried with the Inuit, the native Greenlanders.

NARRATOR
Other investigators claim the Vikings perished in a war with the Inuit.

The Sagas, the ancient records of arctic history, tell of battles lost by the settlers. In one 18 Vikings lost their lives.

Pioneering excavations at the beginning of the 20th century, provided further valuable leads.

From graves in Greenland's Viking churchyards, archaeologists recovered human bones, and farmhouse middens yielded thousands of artifacts.

They even found medieval clothing, perfectly preserved in the permafrost with their colors still fast.

Now, almost a century later, the bones are finally revealing clues that may explain why the Vikings disappeared.

The University of Copenhagen, is the new resting-place for these samples. It is also where Dr Niels Lynnerup has been pursuing the mystery. A pathologist well versed in the latest forensic methodology, he has been using modern techniques to analyze the ancient bones.

And he has come away with a significant discovery - his research shows that the Vikings' life expectancy fell during

the last years of the settlements. The cause - a dramatic decline in people's living conditions and a corresponding deterioration in health.

NIELS LYNNERUP
We have the remains of 350 Norse. The average life span was about 30 to 35 years. I would think maybe there was a decline throughout the settlement period. People would be living maybe to 35 years old and then gradually life span fell by a couple of years throughout the 500 years of settlement.

NARRATOR
Dr Lynnerup turned back to the bones for an explanation. Skull X-rays revealed that in the later years, many of the Vikings suffered from Middle Ear Disease, a sign of deteriorating health that indicated susceptibility to more serious diseases.

NIELS LYNNERUP
We found that there was a higher frequency of middle ear disease in the later settlement period as compared to the early settlement period.

NEILS LYNNERUP
Again, indicating that living conditions were getting worse; more and more people were getting common diseases such as pneumonia and then again, that would mean that more were to die from that disease.

NARRATOR
Further analysis of the bones revealed another important clue.

NIELS LYNNERUP
We also found that there was an over-representation of young, adult female skeletons in the graveyards, which could also indicate worsened living conditions. Because we know that young females along with infants and the very old are those most susceptible to diseases.

NARRATOR
Lynnerup's discoveries point to a crisis. The people most vital to the future of the settlements, young women of child bearing age, were dying off.

And in the silted up ruins of a farmhouse, the archaeologists found a chilling pointer to the fate of the other settlers. Lying in the kitchen were the bones of a newborn calf and a Norwegian elkhound, a Viking hunting dog. The bones were covered in knife marks. Both creatures had been butchered and eaten.

The investigators knew no Viking family would have slaughtered their hunting dog unless faced with certain starvation.

A study of fossilized flies provides confirmation that a famine raged in Greenland in the last years of the Viking colony. At Sheffield University, Peter Skidmore has pieced together the story, using flies recovered from rooms at the farmhouse where the dog bones were found.

PETER SKIDMORE
Fossilized flies can tell us a very great deal. Some of the material from Greenland that I've examined has been amazing condition. I have here a batch of specimens that Max has extracted from one particular room in the Norse dwelling. That species...telomerina flavipes... only bred in situations that were warm. It's what they call a thermofluous fly and it breeds in decaying animal matter. The sort of situation that this fly would require would be found in a dark warm room, in those days, with plenty of droppings. Precisely a description of the Norse living room in those days.

NARRATOR
As he'd expected, Skidmore found warmth-loving flies on the floors of the bedroom and living room at the farmhouse. While in the food larder, another type had flourished. This fly loved colder conditions and lived off meat.

But on the top layer of silt, formed at the end of the Vikings' occupation, he found something quite different. The warmth loving flies had disappeared and the cold loving flesh eaters had moved into the bedroom. Skidmore knew what that meant. They'd gone there to feed on the dead bodies of the settlers.

PETER SKIDMORE
Looking at the flies, there was a buildup of carrion in the bedroom. And it looked all pretty sinister really. That possibly, the occupants had died in their beds.

NARRATOR
In the hope of discovering the cause of this tragedy, the scientists looked to Greenland's forbidding interior - almost entirely covered by its ice sheet, two miles deep and more than a quarter of a million years old. Here, an extraordinary scientific feat might provide critical evidence that could lead to solving the mystery of the Vikings' disappearance.

The Greenland Ice Sheet Project, or GISP II, was a difficult drilling operation in the barren interior. A single core of ice was carefully extracted from the ice sheet. Some sections were bought to the University of New Hampshire for storage and study.

PAUL MAYEWSKI
The thickness of the ice in the area that we conducted our study is about 3000 meters, in fact it's exactly 3056.4 meters because we drilled right down to the bedrock.

NARRATOR
As snow falls on Greenland it absorbs chemicals, gasses and dust from the atmosphere. Over time, this snow compacts into ice. Scientists looking at a section of ice-core from the past 250,000 years can get a good idea of what was happening to the climate at any given time.

PAUL MAYEWSKI
The ice-core is a 5.2 inch diameter core and what's particularly remarkable is that within any layer we can recover 50 different measures or descriptions of what the environment is like. So here we have the best preserved record of frozen atmosphere for that one particular year.

NARRATOR
The ice-cores reveal that when the Vikings first settled in Greenland, around the year 1000, the climate was exceptionally fine. But it wasn't to last.

JUDITH JESCH
There is evidence when the Viking colony was first established that the weather was actually rather good. Um, there is even a 13th century Norwegian text which says that the weather in Greenland in the summer at any rate is nicer than in either Iceland or Norway. Um, but what seems to have happened is that the weather got gradually colder.

NARRATOR
To measure how cold it became, Dr Lisa Barlow of the University of Colorado analyzed the atoms inside the ice-cores. She was looking for deuterium.

LISA BARLOW

Most water molecules are made out of two hydrogen and one oxygen atom. A very small percentage of water molecules are made out of one hydrogen and one heavy hydrogen which is called deuterium and an oxygen molecule. Now, these water molecules with the deuterium are slightly heavier and so they respond differently to processes like evaporation and precipitation.

NARRATOR
In cold weather, the heavy deuterium does not evaporate as easily, so less falls back to earth in snow.

LISA BARLOW
So, as you look through the snow, if you had a profile from the surface of the snow sort of looking down through time you have this nice seasonal signal where in the summer time there is a little bit more of the deuterium, in the winter time there is a little less.

NARRATOR
Dr Barlow found that the ice-cores from the end of Viking times contain abnormally little deuterium. Her conclusion: The climate grew colder. In fact, Greenland was hit by a small ice age.

PAUL MAYEWSKI
When the Norse traveled to Greenland during very mild period the medieval warm period, the conditions were relatively mild. Having lived there for many generations, they would have been extremely surprised to suddenly find out in the late 1300s and early 1400s that things were changing around them.

NARRATOR
But the evidence of the series of cold summers came only from the ice in the center of Greenland. To make sure that the climate had also changed at the settlements on the coast, Dr Henry Fricke of the University of Michigan compared the ice-core results with data from the bodies of the Vikings themselves.

He knew that teeth, too, could provide an accurate record of weather during a person's lifetime.

HENRY FRICKE
In my research I am taking this one step further and I am using the oxygen isotope ratio of tooth enamel to act as sort of a record or a proxy for that of local rain or snow. And we can do that because um in the case of the Norse they were probably getting their drinking water from little ponds, streams, melt water from snow so that water from the surface gets incorporated into their bodies, into their blood And we can do that because um in the case of the Norse they were probably getting their drinking water from little ponds, streams, melt water from snow so that water from the surface gets incorporated into their bodies, into their blood
and then eventually into their teeth so that the oxygen isotope ratio of their tooth enamel can act as a record for what the temperature was at the time that that person was living.

NARRATOR
This tooth comes from a Viking graveyard in Greenland. Dr Fricke only needs a few grains of its enamel for his tests.

The 650-year-old tooth enamel is mixed with chemicals and heated to 1400 degrees centigrade. The resulting gas is then put through a mass spectrometer that measures the oxygen isotope ratio. Fricke runs tests on a series of teeth from carbon dated skeletons of different ages.

His results confirm a drop in surface temperature at around the middle of the 14th century.

He notes that this date coincides with the very time that the emissary Ivar Barderson had found the deserted western settlement.

HENRY FRICKE
This isotopic evidence confirms the results that the people working on ice-cores are getting. The cooling that they observed in those ice-cores was in fact lived through by the people right there on the coast of Greenland.

NARRATOR
A mini ice age could have delivered the death blow to the Vikings' farming system. Lisa Barlow believes it caused their hay crops to fail, leaving the cattle and sheep without food for the bitter winter months ahead.

LISA BARLOW
If you have lower summer temperatures then that affects the amount of grass that can be grown. Now, the important thing about that is not necessarily that summer but the fact that these people are trying to feed their cow for the next nine months of winter on whatever they can grow in the summertime.

NARRATOR
Proof that the harvest failed came from an unlikely source-fossils of the beetles that lived in the fields and haylofts of Viking Greenland. When scientists counted these fossilized insects, they found that their numbers fell dramatically in the last years of the settlements-an irrefutable sign that hay production slumped to crisis levels.

PAUL BUCKLAND
In some of the later samples, there is a suggestion in changes in the fauna that the hayfield is being denuded, that either they are so short of hay they are over exploiting it or they are over grazing it. And the reason they are taking too much hay is that they haven't enough to keep their animals alive through the winter. Eventually, you reach a critical point where you can't maintain your breeding population of animals and if your stock dies, then you die.

NARRATOR
So there was more to the Vikings disappearance than the climate change alone.
Dr Bent Fredskild is a Danish botanist who worked on the mystery for more than 40 years. He believes that the Vikings were finding it difficult to feed their livestock long before temperatures plunged Greenland into a mini ice age.

On his research trips to Greenland, Dr Fredskild took hundreds of mud cores from lake beds. He found that the samples contained soil blown off the meadows in Viking times-indicating that the settlers had over-grazed the land, causing widespread erosion.

BENT FREDSKILD
The large erosion area we are going to see is just behind this region in front of the two dark bed rocks.

NARRATOR
In modern times, over-grazing has again depleted the thin soil, and Fredskild believes the situation was the same in the Middle Ages. Then, as now, the sheep and cattle ate away the groundcover, once blooming with plants like the Greenland willow.

DR BENT FREDSKILD
Here is a large root of a Norland willow, the same species as grown there and it has been exposed as a result of severe erosion. This erosion started because of over grazing. The sheep broke the thin vegetation cover.

NARRATOR
With the vegetation cover broken, the harsh wind coming off the inland ice tears into the soil and blows it away. Dr Fredskild believes that, by over-grazing, the Vikings turned their once-fertile pasture into wasteland. Frozen, starving,

with their animals dying around them, isolated in the Northern wastes behind an ever-growing wall of sea ice, did the Vikings hang on to their old ways, trying to raise cattle and sheep as they had always done, courting disaster? Did these Greenland Vikings succumb to a crisis so overwhelming that those who could not escape simply took to their beds to wait for the inevitable?

NARRATOR
Professor Thomas McGovern has pursued the answers to these questions for three decades. He has excavated sites here in Iceland as well as in Greenland. He is the coordinator of an international multi-disciplinary organization that has been actively investigating the Greenland Vikings disappearance.

Evidence from both Greenland and Iceland is critical for solving the mystery. In Greenland's Eastern Settlement, every fragment discarded while the farm was occupied was painstakingly gathered up. By the time the excavation closed, 50,000 samples were ready to be sent around the world for analysis and identification.

Some of the bones from previous expeditions made their way to City University in the busy heart of New York, where Professor McGovern studied them in detail. By looking at the bones and at the layers in which they were formed, McGovern can deduce what the people ate and how their diets changed over time.

THOMAS MCGOVERN
We've got a tray of bones right here where you can see some of these animal bones laid out here, this is a pretty typical set of remains you get from archaeological excavation. Some of these things are cattle bones brought in from Europe. Here is a little piece of a sheep jaw, goats, pigs, dogs, horses. Some of them, however, are animals that are wild or local animals like caribou, animals like seals.

NARRATOR
But McGovern concludes the Greenland Vikings only turned to fishing and hunting when the mini ice age threatened their standard food supplies. And even then they ate very little food from the sea compared to their Viking neighbors in Iceland.

THOMAS MCGOVERN
In Iceland, by the late 1200s / early 1300s, the same period as we are just looking at in this tray here from Greenland, if we look at a tray, a very comparable section from Iceland, a very small one, we can see that there is again a bunch of bones here but they are different. Fish bones, we have some birds present here, we have little fragments of whale bones, but most of this tray is fish including one great big ling - got in there somehow. Got a lot of cod.

NARRATOR
In Iceland the Vikings turned to the ocean to provide the necessary resources to survive the global cooling. But in remote Greenland, their relatives seemed not to understand the need for change.

Maariu Olsen is a native of Greenland and an Inuit historian.

MAARIU OLSEN
This land is big. It's beautiful, but it is also very harsh. It is a harsh nature. You have to have some certain skills to survive, especially in the old days. The Vikings didn't really catch the meaning of life here.

NARRATOR
Of the two peoples, the Thule Inuit had been in Greenland for less time than the Vikings, yet they used their survival skills and quickly adapted to their new land.

Modern day descendents of the original Thule Inuit now live in remote coastal villages.

Their ancestors arrived in Southern Greenland from the high Arctic in the 12th and 13th centuries.

They were hunter gathers and today in the remote areas of Greenland, the men still live by hunting.

Boys make their first kill before reaching their teens.

Their quarry can be seal, walrus, polar bear or whale. But these men from the isolated settlement of Kappersillit are in pursuit of caribou.

Over the centuries , the diet of the Inuit has hardly changed. It still depends on what the hunters bring home.

During the mini ice-age, the Inuit, like the Iceland Vikings, didn't go hungry. There was always prey to be caught.

But there was more to the story.

Investigators had made an unusual discovery - fully clothed Inuit bodies desiccated over the centuries by the arctic cold.

JUDITH JESCH
Archaeologists have also found the mummified bodies of some Inuit people who were all dressed appropriately in furs and hides and were clearly much better adapted to survive this mini Ice Age.

NARRATOR
This extraordinary discovery sheds new light on old mysteries.

These mummified bodies of what appears to be a single Inuit family were preserved by permafrost and date from around the time of the Vikings disappearance.

It is thought they were on board an Inuit ship that suffered a tragic accident. The family drowned at sea.

When their bodies reached shore, they were mummified by the cold, dry arctic winds and preserved for history.

Their extraordinary state of preservation has allowed archaeologists to study their clothes. Each wore an outfit meticulously tailored from skins. Caribou and seal hides thick enough to withstand the onslaught of the harshest weather.

Even in death, it is evident that they were well protected from the elements.

Their clothing is quite a contrast from the that worn by the Vikings.

JUDITH JESCH
We can see that as conditions grew colder in Greenland, the Vikings didn't actually adapt very well to the changing conditions. At Herjolfsnes in the South of Greenland, archaeologists have found clothing from the 15th century. This is typical woolen clothing of the latest fashion. They wore capes, hooded capes with long tails which was the height of fashion at that time.

NARRATOR
But fashion is not always functional, and in this case, may even have contributed to the Vikings demise. With the onset of severe cold, these clothes could not protect the settlers from the elements.
Investigators concluded that as the mini Ice Age enveloped the northern latitudes, the Vikings of Greenland bought disaster on themselves by failing to adapt to the tried and true ways of their Inuit neighbors.

THOMAS MCGOVERN

The Norse in Greenland certainly perished at a time of climactic change, a time where the climate changes were mostly unfavorable to them, but it is good to recognize that not everybody in Greenland perished at the same time. The Inuits who, by this point, were living in most parts of Greenland, survived quite nicely as far as we know through the same period and they were the ancestors of the modern Greenlandic population which exists today.

NARRATOR
Apparently there was some fundamental barrier that prevented the Vikings from adapting to the deteriorating, but still survivable arctic climate.

THOMAS MCGOVERN
So, Greenland did not become uninhabitable for all humans. What did they become though was extremely hostile to the kind of society the Norse Greenlanders had constructed. A society that had all these trappings of middle Europe, the society that had its bishops, its monasteries, its nunneries, its rich men, its poor men, all the bits of Europe of middle Europe which had come into Greenland at this point were expensive. They were expensive socially and they were expensive environmentally as well.

NARRATOR
Isolated in Greenland, the Vikings seemed to have held on to their old ways too long.

Even though scientists found some evidence of wild animals in the archeological record toward the end of the Vikings presence in Greenland, they believed that the Vikings belated effort to change their diet failed to meet all their dietary needs.

Fossils of blow flies from Viking and Eskimo middens provide evidence for entomologist Peter Skidmore to conclude that the Vikings went hungry while the Inuit had more food than they could eat.

PETER SKIDMORE
The species that indicate carrion on the midden are the blowflies. It appears from the fly remains present that there was no carrion or even marrow on the Norse middens. We know that there was a lot of bone material but there was no marrow. In contrast, the Eskimo midden, an enormous amount of carrion and masses of marrow. They had plenty of it. They were availing themselves of the seals and the fish in the fjords. The Norse economy seemed to have been based entirely on the sheep and cattle. So, they were taking all the marrow out of the bones and they were scraping clean and probably boiling all the meat off as well. The conclusion that one would be forced to draw from that would be that the Eskimos could be profligate with meat products.

NARRATOR
Not so the Vikings. When they needed to most, the Norse failed to adapt and take advantage of the life-giving resources around them.

Why, in the end, didn't the Vikings learn how to hunt from the Inuit? Thomas McGovern thinks the church might have played a critical role.

THOMAS MCGOVERN
The church may have played a role in this strange barrier between these two cultures. You may think that the Norse and the Inuit actually did not coexist in Greenland at all because there are so few finds of Inuit objects on Norse farms. And there are so few examples of Norse imitation you know of adaptation.

NARRATOR
McGovern is convinced that the church preached avoidance of the Inuit because they were not Christians. If contact was forbidden, the Vikings would never have been able to learn from their hardy Inuit neighbors, even in this time of crisis.

THOMAS MCGOVERN
Why would a Norse seal hunter not pick up some of the Inuit technology and I think part of the answer is of course, if you went and talked to an old, experienced Inuit hunter and persuaded him to teach you a few secrets, he would have talked to you about how to give water to the seal when it is brought up to the ice, he would talk to you about the proper prayers to say as you were doing it or from the church's standpoint, what he would have done was fill your head full of heathen magic so we can easily see scenarios where the church's interest in limiting culture between these two cultures and regulating its farming could have had a really chilling effect in terms of effective interaction, effective learning between these two different cultures. There certainly was a barrier maintained between them, it wasn't accidental, it had to have been maintained at some considerable trouble and expense on somebody's part for a long period.

NARRATOR
Evidence to support McGovern's argument comes from the number of churches built in Greenland - testimony to the importance the church played in the lives of the Viking settlers. These buildings formed the center not just of the people's spiritual faith, but of their entire society.
The church's power was clear - the adulterous seducer was burnt to death in the precincts of the church at Hvalsey.

And from a grave in the shadow of the Viking Cathedral at Gardner comes another striking indication of the church's power. The grave contained the bones of a bishop, who was buried with his badges of office-his holy ring and his crosier.

JUDITH JESCH
There is some evidence that the church in Greenland held a very firm grip on the people there; in the 14th Century as well as collecting tithes from the farms the church also imposed an export tax which may have led to deterioration in income from trade. We also hear that many of the hunting rites in Greenland belonged to the church so, although there was abundant whale, reindeer and polar bears, people could only hunt these creatures with the permission of the bishop.

THOMAS MCGOVERN
One of the things which is quite clear, is the Norse Greenlanders created vulnerabilities in their society to any type of climatic or environmental change. When you have these Cathedrals in the arctic, when you have society based on imported goods in a circumstance where connection with the homeland is difficult your setting yourself us for long-term trouble. So I think that one of the lessons from Norse Greenlanders certainly is that the kind of decisions and the kinds of structures they put into their society in the early days in the 9th, 10th and 12th centuries when the climate was somewhat different, set them up for considerable vulnerability to any fluctuation later. The conservatism of society, it's rigidity in many respects, we can see in many different aspects seem to have led them, instead of invading, instead of responding to change by going fishing, doing something different, instead they went down the same path and perhaps tried harder, they built bigger Churches, rather than trying a different adaptation.

NARRATOR
From the stones, ice and meadows of Greenland, the tragic story of the lost Vikings has finally come to light. Scientists have pieced together an amazing tale of failure. It seems the trigger for the Vikings downfall was a deterioration of the climate. Ice core samples show that the mini ice age enveloped them, ultimately causing their crops to fail and their cattle to starve.

In the cold, the people's health began to falter.

Malnourished and weakened by ear and upper respiratory infections, young women and children began to die.

The bleak story investigators have pieced together tells that in desperation, Viking elders finally did try to follow the hunting and fishing techniques of the Inuit, but through ignorance, or the dictates of an all-powerful church, they learned too little too late.

The archeological find of the slaughtered precious hunting dog revealed their state of desperation.

Combined efforts by scientists on both sides of the Atlantic have pieced together a tale of doom.

PETER SKIDMORE
It seems to me very clear that they were living at the limit of possible sustained existence. Had they gone over to the Inuit lifestyle of adapting more to their environment, they probably may have survived. But I think that they just turned to a situation where it was just not possible to continue their lifestyle.

NARRATOR
But there are still some loose ends-some crucial questions that the scientists cannot fully explain. Although they found many skeletons in the graveyards, there were none in the Viking houses.

THOMAS MCGOVERN
One thing that is missing from this whole grim story of the end of Norse Greenland, is where are the human bones and that is the real question. We have virtually no human bones from inside Norse houses that are contemporary with the end of the settlement. They are just not there. We have plenty of people buried in the churchyard, but that is the sort of thing that happens in an orderly fashion as this society is still functioning. What happened to the last ones? And the clear answer to this question is we don't know. There's been speculation that the Greenlanders, at least some of them returned to Iceland. It's a nice thought but we have no real proof of this. There's been speculation that the last Greenlanders were carried off as slaves by Barbary Pirates or by other people and wound up as Icelanders were to do in later centuries, taken off to Morocco or elsewhere. We again have no evidence of this. So we really don't know what happened to the last group of people.

JUDITH JESCH
Personally, I think the most likely explanation is that the colony dwindled until they were very small numbers and probably they sailed away and either never arrived or went somewhere and we don't know about where they might have gone.

NARRATOR
Scientists suspect that, in the face of fierce adversity, the last of the Viking colonists in Greenland opted to take refuge on warmer, more comfortable, and friendlier shores. They may have tried to return to Norway, where their ancestors had left from 500 years before. They may even have struck out for America. But whatever their intended destination, they first had treacherous seas to cross.

THOMAS MCGOVERN
My own speculation to throw into the pot is that, well, if you were failing in your farm and your whole settlement was going down, a last resort might be to get into your boat and try to go to the Eastern settlement, and go somewhere else. And Greenland, as everyone who has sailed there can attest, is a dangerous place. And just because you set out on a journey doesn't mean you make it. So one location for the last of the Norse Greenlanders may simply be at the bottom of the sea.

NARRATOR
Whether or not the last of the Greenland Vikings drowned at sea, ventured all the way to the American continent, or successfully returned home to Norway, it is clear that their legacy is one of failed adaptation.

These Vikings depended on a social system that lacked flexibility-one that worked in a certain place at a certain time but could not change. Instead of adapting and surviving in the face of a deteriorating climate and an environment that no longer supported the population, it appears the Greenland Vikings succumbed to their own rigidity and disappeared from history.